EGS Science System and Operations Certification Plan Development
Process Description Document – *working draft*

INDEX

1.0   Overview

This document defines a high level plan for the EGS Science System and Operations Certification of "at launch capabilities", and post-launch capabilities at NSIDC. As part of Operations Readiness Consolidated Test Concept, ESDIS has decided to conduct the science certification tests which include functional and performance verification using operations scenarios, operations procedures, and operations personnel activities as a single entity. The series of certification tests use the ECS SDP Release 2.0 capabilities / functions identified by ECS /ESDIS. The certification tests will use scenarios representative of ECS SDP Release 2.0 capabilities, based primarily on the Release B Operations Scenarios (605-CD-002-001), and Operations Scenarios-ECS release B0 Impacts (220-TP-001-001). The detailed test procedures will use the DAAC operations procedures for execution of the tests.

The certification will test the ECS SDP Release 2.0 capabilities in the context of the Science Data ground system[1], including formal interface verification of the EGS EDOS, Ebnet, and other EGS components and externals. The certification tests will use the following EGS tests currently under development as a foundation:

EGS5   ECS to Landsat 7 Interoperability Confidence Test
EGS7   EGS Security Confidence Test
EGS9   ASTER Science Operations Confidence Test
EGS10   AM1 Science Data Processing End-To-End Confidence Test
EGS11   EGS Science Data System Performance Test

2.0 Scope

The goal of the certification tests is to verify and formally demonstrate that the EGS Science System meets key EGS system level functional, interface, and performance requirements such that the system capabilities and operational procedures are adequate at launch for AM1 and Landsat-7 science operations support. The tests will be conducted at the GSFC, LaRC, EDC, and NSIDC[2] DAACs. The test results are direct input to and preparation for the Operations Readiness Review (ORR) milestone.

RMA requirements, archival and processing capacities that are normally verified by analysis are not within the scope of the certification tests. Architectural and design aspects of the system are also not being certified with these tests.

---

[1] Note: The EGS Science System and Operations Certification Plan described in this document is executed prior to the overall EGS AM-1 Daily Operations Certification Test which combines Space Craft Operations Certification and Science System Operations Certification.
[2] The NSIDC DAAC certification is expected to occur post-launch with "drop 5" of the Release 2.0 ECS SDP integrated into the EGS.

3.0   Consolidated Science System Operations Readiness Test Concept

The consolidated ESDIS Science System Operations Readiness test plan consists of :

- Developer testing before system deployment
- Science System Integration & Test (SSI&T)
- Joint DAAC/EGS I&T/ECS system readiness testing, which include functional and qualification tests, before System turn over
- Science System /Operations Certification before ORR/FOR/FRR

The certification tests take into consideration the functional and qualification tests, including formal interface tests, SSI&T plan, and DAAC Tests/operations readiness activities in order to determine the detailed system level functions/operations to be verified during certification.

The certification tests are conducted after successful completion of:
- System verification/acceptance and functional tests, component performance tests.
- Formal SSI&T (Certification Baseline, SSI&T continues post-certification)
- DAAC operational readiness activities (Certification Baseline, DAAC Ops Readiness activities continue post-certification)
- EGSI&T/DAAC qualification tests which contain more detailed scenarios and are prerequisite to the certification tests.

4.0 Certification Plan Development Process

4.1 Applicability of Prior EGS I&T Activities

EGS I&T has developed a series of Interface, Qualification, and System Level Tests as part of EGS Test Program which will be modified to become the joint EGS Science System and Operations Certification tests. The formal Interface tests may be incorporated as part of the Qualification tests. The Qualification tests will be modified jointly with the DAACS and be conducted as part of joint System Readiness Tests. The Qualification Tests will also be coordinated with the ECS developer SDP Acceptance Test Scenarios. The Qualification tests are prerequisites to the EGS system level Science & Operations Certification Tests. The five system level tests referred to in section 1 will be modified to include the DAAC Operations Procedures for Science System/ Operations Certification. A brief description of these tests, is given in section 5. Note the scope of these tests is currently being revised to reflect the DAAC Daily Activities /Timelines discussed in item 4.3 of this document.

4.2   DAAC Operations Scenarios

Updates to the ECS SDP Release B Operations Scenarios (605-CD-002-001) have been considered with respect to the capability limitations in B0. These are described in Operations Scenarios-ECS Release B.0 Impacts(220-TP-001-001). This document also includes some additional scenarios for Release B.0 workarounds. As the scope of the ECS SDP release 2.0, "at launch" system, is different from the ECS SDP Release B0 system, it will be necessary to identify the scenarios (or parts there of) applicable for Release 2.0, 'at launch' system. In addition, it is proposed that additional items be identified which are not currently in the scenarios, but which need to be verified in the certification tests. These may include:

- Operational workarounds, for the "at launch system"
- Start or restart of the system
- Emergency shutdown
- Management and administrative activities
- DAAC user support activities
- Site unique activities
- Anomaly conditions etc.

4.3 DAAC Daily Activities /Timelines

As part of the Certification Test development process it will be necessary to identify all essential operational activities which occur during a day, at each DAAC. This will include all operational activities along with the frequency and times of occurrence during a day. The Timeline Charts will be used as a master reference to develop the "3 Days in the Life" Certification Test scope, and will be cross-referenced to test packages and DAAC operations procedures which verify the activities. The activity has been initiated where EGS I&T prepared a consolidated list of activities and Timeline Charts for each DAAC. These have been revised in joint meetings, and will continue to be updated with detailed inputs from each DAAC.

4.4   DAAC Operations Procedures

A draft DAAC operations procedure document is expected to be available in January '98. DAACs will work the details of the operations procedures which need to be verified in certification tests, and review the staffing and training requirements. The operations test procedures will be integrated into the test packages identified above. If any of the operations procedures which are identified for verification are not required by the identified tests, they will be included as additional test cases and verified.

4.5 Certification Tests Development

The planned certification test package development activity consists of:

1) Development of a number of tests required for the verification of all major functional, performance requirements and operational procedures, starting with the tests given in section 5
2) Development of test procedures package consisting of test cases, test procedure steps, operator actions, and expected results.

The test development as depicted in Exhibit-1, consists of the following:

*   Review the ECS SDP Release B0 operational scenarios ((605-CD-002-001 and 220-TP-001-001), and identify scenarios/part of the scenarios applicable for Release 2.0, based on the Release 2.0 capabilities.
*   Review the EGS Functional and Performance Tests and modify them to include all essential Release 2.0 capabilities, and incorporate the applicable operational scenarios (in part or in full) to create EGS Science System & Operations Certification Tests
*   Ensure that the tests reflects realistic operational activities including operations workarounds, nominal management and administrative activities and anomaly conditions.
*   The series of tests are to be developed for each DAAC using the site specific activities and preferences.

The test procedure development process which is also given in Exhibit 1, is as follows:
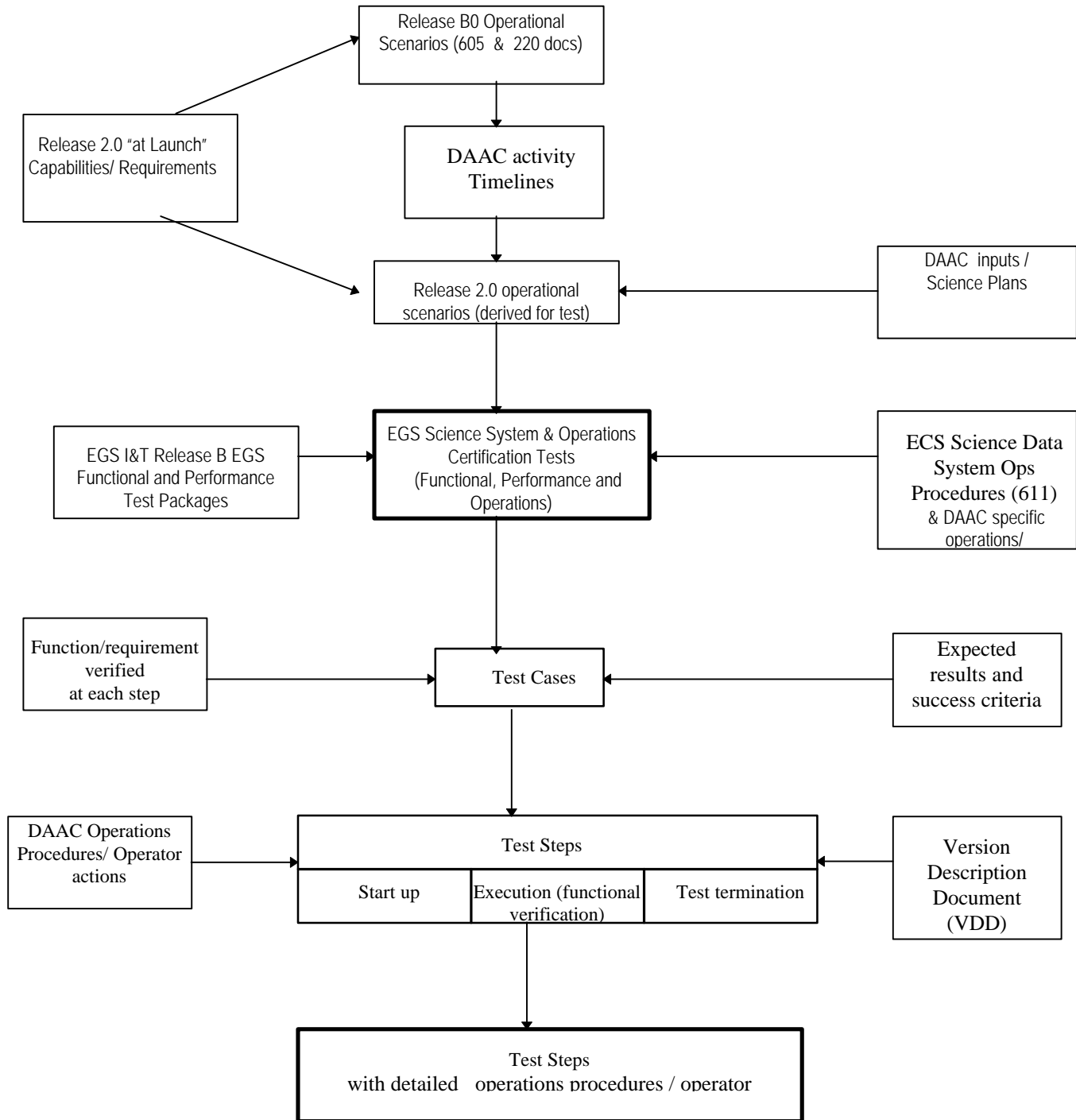
The test procedure definition uses a modified version of the process currently used for the EGS tests. The tests developed with applicable requirements/capabilities /scenarios are used in the detailed development of test procedures; this consists of:

*   Test decomposition into a number of test cases
*   For each test case, test steps are identified :
    *   for start of the system in the required configuration
    *   for verification of functional and performance requirements/ capabilities
    *   for returning the system for the original configuration
*   Detailed test steps including operator actions/commands are developed using the DAAC operations procedures.

4.6 Test Packages for DAACs

The Tests developed will be individually tailored for GSFC, EDC, LaRC, and NSIDC and packaged as separate tests for each DAAC.

EGS Science System and Operations Certification Plan Development
Process Description Document – *working draft*

Release B0 Operational
Scenarios (605 & 220 docs)

Release 2.0 "at Launch"
Capabilities/ Requirements

DAAC activity
Timelines

DAAC inputs /
Science Plans

Release 2.0 operational
scenarios (derived for test)

EGS I&T Release B EGS
Functional and Performance
Test Packages

EGS Science System & Operations
Certification Tests
(Functional, Performance and
Operations)

ECS Science Data
System Ops
Procedures (611)
& DAAC specific
operations/

Function/requirement
verified
at each step

Test Cases

Expected
results and
success criteria

DAAC Operations
Procedures/ Operator
actions

Test Steps

| Start up | Execution (functional verification) | Test termination |

Version
Description
Document
(VDD)

Test Steps
with detailed   operations procedures / operator

EXHIBIT 1 EGS Science System & Operations Certification
Test Package Development Process

4.7 Test package development—allocation of responsibility

No.	Activity	Primary responsibility	Support	Review	Remarks
1	Identify 2.0 capability/requirements	ESDIS/ECS		DAACS EGSI&T	
2	Release B/B0 Operational Scenarios	ESDIS/ECS		DAACS EGSI&T	
3	Map 2.0 capability/ requirements operational scenarios (for test)	EGSI&T	DAACs		
4	DAAC operational activities--- Time lines	EGSI&T /DAACS			
5	Identify release 2.0 operational scenarios (for test)	EGSI&T / DAACs			
6	Expand EGS I&T Release 2.0 functional and performance tests to become EGS Science System & Operations Certification Tests	EGSI&T		DAACs	
7	Test case development	EGSI&T		DAACs	
8	Test procedure steps	EGSI&T		DAACs	
9	ECS Science Data System Operations Procedures	ECS /ESDIS		DAACs	(611 Doc)
10	DAAC Operations Procedures	DAACs			
11	Test procedures with DAAC operations steps/ operator actions	DAACs	EGSI&T		
12	Identify Simulated/ Science Test Data	ITs/ DAACs	EGS I&T		

5.0   Test Package Descriptions (Examples based on the EGS Tests)

Examples of test descriptions, based on the currently available EGS test packages is given below to illustrate the tests likely to be developed for the certification tests.

5.1   ECS-Landsat-7 Interoperability Test (EGS5)

System interfaces between Landsat 7 and the ECS provide the means for transferring Landsat 7 data and for sending messages supporting data transfer. Additionally, these interfaces support exchange of information concerning system status, user activity, product pricing, directory and guide information. This thread provides end-to-end tests for all the interfaces and will verify that all transfers are successful and that the data are made available to end users.

The Landsat 7 elements that have system interfaces to the ECS are the LPS, IAS, MMO, MOC, and the IGSs. The test package provides a list of the ECS-Landsat 7 system

interface data flows, identifying source and destination for each flow. These interfaces are fully supported by ECS Release B.0.

The objectives of this test are to:

- Verify the ability of the ECS to transfer Level 0R data using Level 0R test data to the LPS
- Verify the ability of the ECS to transfer Level 0R inventory metadata using test data to the LPS
- Verify the ability of the ECS to transfer Level 0R browse data using test data to the LPS
- Verify the ability of the ECS to exchange system-status messages, metadata, and other data and reports with the IAS, MMO, and MOC
- Verify the ability of the ECS to exchange Landsat 7 metadata with the IGSs and
- Verify the ability of the Landsat 7 system to place information on the ECS Advertising Service and the ECS Document Data Server.

This test will be conducted at EDC DAAC

5.2   EGS Security Test (EGS7)

ECS security requires both client and server to use mechanisms to protect resources as well as the integrity of the data exchanged. These mechanism are authentication, authorization, tamper-proofing (for data Integrity) and encryption (for Privacy). While authentication should always be used in every conversation between a client and a server, the mechanisms for authorization, data integrity and privacy are based on security policies of the system(s) and the application-specific need for those mechanisms. Authorization is the process of deciding what sort of users/groups should be allowed to access what services /resources and then allow / deny the service. In authorization, each resource is associated with a list of permissions that should be granted to different kinds of user and different kinds of access operations.

When data is transmitted over the network from one application to another, the integrity of the data should be preserved. This is to make sure that the copy of the data the receiver gets is exactly the same as the data that the sender transmits.

Test Objectives:

The objectives of this test is to demonstrate ECS security capability to:

- provide user access to secure data.
- protect system components and data from unauthorized access.
- prevent against deliberate or intentional compromise/corruption of data.

- provide countermeasures for security threats such as unauthorized modification of data.
- recover from security violations and security safeguards.
- confirm authentication, access control, and data integrity.
- ensure that data confidentiality protections exist at the system and site level.
- perform intrusion detection checks in order to maintain the integrity of ECS resources.
- provide automatic alerts for intrusion events.
- provide the capability to analyze security audit trails.
- provide the mechanisms to generate reports of security activities.
- provide virus detection.

The security test will be performed between EGS component systems, user(s), and all DAAC's.

5.3   ASTER Science Operations Test (EGS9)

The ASTER GDS and ECS combine to provide ground support for mission operations and science data processing for the ASTER instrument on board the EOS AM-1 spacecraft. Ground support includes the following: science data processing, distribution, and archival; and ground systems communication and management. In addition, the ASTER GDS will be inter-operable with ECS so that an EOSDIS user or ASTER GDS user will be able to view the data holdings and order production data of the other system.

The objectives of this test are to:

- Verify the ability of the ASTER GDS to produce and ship data tapes containing 1A and 1B product files along with associated metadata and browse files.
- Verify the ability of the ECS to provide directory and inventory searches, browse capabilities, product requests and pricing information to ECS users.
- Verify the ability of the ASTER GDS to provide directory and inventory searches, browse capabilities, product requests and other information to ASTER users.
- Verify ECS system and network management capabilities.
- Verify ECS DAR search, request and status functions.
- Verify that ECS has the capabilities to receive EDSs from EDOS.
- Verify that ECS can send requested EDSs to ASTER.

This test will be conducted at EDC DAAC

5.4   AM1 End-To-End Science Data Processing Test (EGS10)

The end-to-end AM1 Science Data Confidence test (EGS10). It aims to demonstrate the readiness of the DAAC to ingest, generate, archive, and distribute the Level 0- and higher science data products. The test will ingest the Level 0 (or other as relevant) and ancillary

data and generate and archive the finished products while the users are doing searches and accessing the data products on the server. The intent is to verify that the individual subsystems at the DAACs interface with each other and with the data sources and destinations of the data products in meeting the requirements of the science community as defined in the F&PRS document.

The scope of the test is:

- Conducted on a DAAC-by-DAAC basis (at GSFC, EDC, LaRC, and NSIDC before launch of AM1) with participation of other DAACs as necessary.
- The tests will focus on instrument threads beginning at the ingest stage and ending with the science users accessing the Level 0- and higher products using the V0 B0SOT (or available) client interface.
- The tests will focus on functional capabilities. Performance will be addressed by a separate test called EGS11.
- A representative set of scenarios, PGEs and associated ESDTs and data will be chosen for each DAAC for the tests in consultation with DAACs and instrument teams. (The representative set should exercise all functions and interfaces. It may not be possible to test all scheduled products).

This test will be conducted at all DAACs.

5.5   EGS Science Data System Performance Test (EGS11)

This test verifies the system-level performance of the EGS Science Data System in an operational environment at all DAACs. The operational activities consist of all activities (as applicable) at each DAAC, from ingest of Level 0 data from all AM 1 instruments, Landsat 7 L0R data from LPS, data production, archival, data access and data distribution. For this test the system will be configured to operate in "a day in the life of a DAAC" scenario, with normal daily operations ("Normal Operations" based on the Science Operations Scenarios, and Release 2.0 Technical Baseline).

No functional requirements are verified in this test, as they will have been verified in the system/subsystem/interface tests that precede this test.

The aim of the test is:

- to verify EGS Science Data System performance when the ingest of all data streams, product generation, archival, data access and distribution activities are being carried out concurrently, according to the normal daily operations schedule of the DAAC,
- to verify the increased performance capabilities for ingest, and archival as specified in the F&PRS.

The test will be conducted at all DAACs.

6.0   Pre-Test Activities

6.1 Management Related Activities:

- Establish a Certification Test Team to conduct the EGS certification tests at each of the DAACs. The team is responsible for:

    - Planning
    - Implementation
    - Monitoring
    - Discrepancy Reporting
    - Design/identify format for reporting the test results and evaluation

- Establish a Review Board at each DAAC

6.2 Other Activities:

- Detailed review of the test packages to identify the test data requirements, operational resources required to plan execution of the tests.
- Software and hardware configuration for the tests
- Ancillary data requirements
- Timelines for conduct of tests
- Concurrency of tests
- Sequence of tests
- Duration of tests
- Coordination with other DAACs
- Coordination with external data suppliers
- Contingency operations and workarounds during tests

6.3 Certification Development Plan Milestones:

A detailed EGS Science System and Operations Certification planning and preparation schedule needs to be developed after review and revision of this preliminary set of milestones[3].

Dec. 1, '97 --complete certification timeline definition (per DAAC) for launch version EGS system

---

[3] The milestone dates are relative and are based on the formal ESDIS schedule distributed at the October 23, 1997 DAAC Managers meeting. The maturity milestones reflect a system level Qualification test start date of March 3, 1998, and a Science System and Operations Certification start date of April 15, 1998. Subject to change.

Dec. 1, '97 – list definition of individual EGS system level certifications tests on a DAAC by DAAC basis, cross-referenced to timeline

Jan. 1, '98 – list definition of DAAC specific Operations Procedures, cross-referenced to EGS system level timeline for each DAAC

Jan. 1, '98 – complete draft of individual EGS system level certification tests on a DAAC by DAAC basis (TBDs defined for capabilities-requirements test scope, work-a-rounds, test data)

Jan. 1, '98 – Definition of individual DAAC EGS System level Qualification Tests (more detailed than Cert tests; defined prerequisites to cert. Tests)

Feb. 1, '98 – 60-day maturity level (i.e. 60 days before test) individual EGS system level certifications tests on a DAAC by DAAC basis (detailed procedures – open TBDs are counted as liens against the test packages) These procedures are dry-run and redlined within 30 days.

Feb. 1, '98 – 45-day maturity level individual DAAC EGS System level Qualification Tests (detailed procedures – open TBDs are counted as liens against the test packages) These procedures are dry-run and redlined within 45 days.

Feb. 1, '98 – 60-day maturity level individual DAAC EGS System level Operations Procedures Qualification Tests (detailed procedures – open TBDs are counted as liens against the ops procedures (???))These procedures are dry-run and redlined within 30 days.

Mar. 1, '98 – 30-day maturity level individual EGS system level Certification tests on a DAAC by DAAC basis (detailed procedures – open TBDs are counted as liens against the test packages) These procedures are dry-run and redlined within 30 days.

Mar. 1, '98 (TBR) – execute individual DAAC EGS System level Qualification Tests (collect formal results, issue DRS/NCRs). Regression test as required.

Mar. 1, 98 (TBR) – execute individual DAAC EGS System level Operations Procedures Qualification Tests (collect formal results, issue DRS/NCRs). Modify procedures as required.

April 15, '98 (TBR)– execute individual EGS system level Certification tests on a DAAC by DAAC basis. (collect formal results, issue DRS/NCRs). Regression test as required. Followed by formal certification assessment report to project; results referenced for ORR,

7.0 Test Results Evaluation

After completion of the testing of each scenario, actions are taken to record /report the results[4] for evaluation. The process may consist of :

- Test completion report
- Test Discrepancy Reporting (DR)
- DR review
- DR tracking
- DR resolution monitoring
- Re-testing
- Documentation changes
- Assessment of the test results

---

[4] Candidate Methods, Procedures and Tools for these activities are available and documented in the EGS I&T Program Plan Rev. 2, May 30, 1997.